JEE–MAIN EXAMINATION – JANUARY 2026

(HELD ON SATURDAY 24th JANUARY 2026) **TIME : 3:00 PM TO 6:00 PM**

CHEMISTRY — TEST PAPER WITH SOLUTION

SECTION-A

51. Choose the **INCORRECT** statement

(1) Among the isotopes of carbon, ^{13}C is a radioactive isotope.

(2) Carbon exhibits negative oxidation states along with +4 and +2.

(3) Carbon cannot exceed its covalency more than four.

(4) CO_2 is the most acidic oxide among the dioxides of group of 14 elements.

Ans. **(1)**

Sol. C^{13} is not radioactive

C^{14} is radioactive

52. The unsaturated ether on acidic hydrolysis produces carbonyl compounds as shown below:-

$CH_3 - CH = CH - O - CH = CH_2$

$\downarrow H_3O^{(+)}$

$CH_3 - CH_2 - CH = O$ and $O = CH - CH_3$

Based on this, predict the solution / reagent that will help to distinguish "P" and "Q" obtained in the following reaction.

$$CH_3 - CH = CH - O - \underset{\displaystyle CH_3}{\overset{|}{C}} = CH_2 \xrightarrow[\Delta]{H_3O^{(+)}} P + Q$$

(1) Lucas reagent

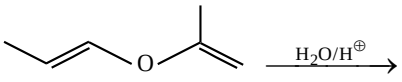
(2) 2,4-DNP reagent

(3) Saturated $NaHSO_3$ solution

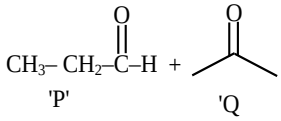
(4) Fehling solution

Ans. **(4)**

Sol.



$\xrightarrow{H_2O/H^{\oplus}}$



'P' 'Q'

'P' and 'Q' can be differentiated by Fehling's test.

P gives positive Fehling test

Q gives negative Fehling test

53. The number of possible tripeptides formed involving alanine (ala), glycine (gly) and valine (val), where no amino acid has been used more than once is :

(1) 6 (2) 3

(3) 4 (4) 8

Ans. **(1)**

Sol. Gly ala val

Gly val ala

Val gly ala

Val ala gly

Ala val gly

Ala gly val

Total tri peptides = 6

54. Two liquids A and B form an ideal solution at temperature T K. At T K , the vapour pressures of pure A and B are 55 and 15 kNm^{-2} respectively. What is the mole fraction of A in solution of A and B in equilibrium with a vapour in which the mole fraction of A is 0.8 ?

(1) 0.5217 (2) 0.480

(3) 0.663 (4) 0.340

Ans. **(1)**

Sol. $$\frac{Y_A}{Y_B} = \frac{P_A^o}{P_B^0} \cdot \frac{X_A}{X_B}$$

$$\frac{0.8}{0.2} = \frac{55}{15} \times \frac{X_A}{X_B}$$

$$\frac{X_A}{X_B} = \frac{60}{55} = \frac{12}{11}$$

$$X_A = \frac{12}{23} = 0.5217$$

55. Consider the following gaseous equilibrium in a closed container of volume "V" at T(K).

$P_2(g) + Q_2(g) \rightleftharpoons 2PQ(g)$

2 moles each of $P_2(g)$, $Q_2(g)$ and PQ (g) are present at equilibrium. Now one mole each of 'P_2' and 'Q_2' are added to the equilibrium keeping the temperature at T(K). The number of moles of P_2, Q_2 and PQ at the new equilibrium, respectively , are -

(1) 2.67, 2.67, 2.67 (2) 1.21, 2.24, 1.56

(3) 1.66, 1.66, 1.66 (4) 2.56, 1.62, 2.24

Ans. (1)

Sol.

$$P_2(g) + Q_2(g) \rightleftharpoons 2PQ(g)$$

$t=t_{eq}$ 2 mole 2 mole 2 mole

$$K_{eq} = \frac{2^2}{2.2} = 1$$

Now 1 mole of each P_2 and Q_2 is added

So reaction will move in forward direction

$$P_2(g) + Q_2(g) \rightleftharpoons 2PQ(g)$$

$t = t'_{eq.}$ $3-x$ $3-x$ $2+2x$

$$K_C = 1 = \frac{(2+2x)^2}{(3-x)(3-x)}$$

$$\frac{2+2x}{3-x} = 1$$

$$2 + 2x = 3 - x$$

$$x = \frac{1}{3}$$

At new equilibrium :

$$\text{Moles of } P_2 = \frac{8}{3} = 2.67$$

$$\text{Moles of } Q_2 = \frac{8}{3} = 2.67$$

$$\text{Moles of PQ} = \frac{8}{3} = 2.67$$

56. Pair of species among the following having same bond order as well as paramagnetic character will be-

(1) O_2^+, N_2^{2-} (2) O_2^-, N_2^+

(3) O_2^+, N_2^- (4) O_2^-, N_2^-

Ans. (3)

Sol.

Species	Bond order	Magnetic Nature
O_2^+	2.5	Paramagnetic
O_2^-	1.5	Paramagnetic
O_2^+	2.5	Paramagnetic
N_2^-	2.5	Paramagnetic
N_2^{2-}	2	Paramagnetic

57. The wavelength of light absorbed for the following complexes are in the order.

$\underset{(I)}{[Co(NH_3)_6]^{3+}}$; $\underset{(II)}{[Co(H_2O)_6]^{3+}}$; $\underset{(III)}{[Co(CN)_6]^{3-}}$;

$\underset{(IV)}{[Co(NH_3)_5(H_2O)]^{3+}}$; $\underset{(V)}{[CoF_6]^{3-}}$

(1) III < I < II < IV < V

(2) III < I < IV < V < II

(3) III < IV < I < II < V

(4) III < I < IV < II < V

Ans. (4)

Sol. Wavelength of light absorbed increases as C.F.S.E of complex decreases.

$[Co(CN)_6]^{3-}$ has maximum CFSE

$[CoF_6]^{3-}$ has least CFSE

Ligand field strength ↑ ; C.F.S.E ↑

Correct wavelength order.

V > II > IV > I > III

58. One mole of Cl_2 (g) was passed into 2 L of cold 2M KOH solution. After the reaction, the concentrations of Cl^-, ClO^- and OH^- are respectively (assume volume remains constant)

(1) 0.75 M , 0.75 M , 1 M

(2) 0.5 M , 0.5 M , 0.5 M

(3) 0.5 M , 0.5 M , 1 M

(4) 1 M , 1M , 1 M

Ans. (3)

Sol. $Cl_2 + 2KOH \rightarrow KCl + KClO + H_2O$

$t = 0$ 1 mole 4 mole

t_f 0 2 mole 1 mole 1 mole

$[OH^-] = 1\ M$

$[Cl^-] = \frac{1}{2} M$

$[ClO^-] = \frac{1}{2} M$

59. A student has planned to prepare acetanilide from aniline using acetic anhydride. The student has started from 9.3g of aniline. However, the student has managed to obtain 11 g of dry acetanilide.

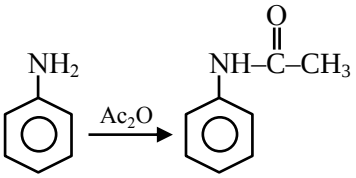
The % yield of this reaction is :-

(1) 81.5% (2) 97.5%

(3) 59.5% (4) 72.5%

Ans. (1)

Sol.



9.3 gm 11 gm

MW = 93 MW = 135

$n = \frac{9.3}{93} = 0.1$ $n = \frac{11}{135} = 0.08148$

$\%\ \text{yield} = \frac{0.08148}{0.1} \times 100 = 81.5\%$

60. Find out the statements which are **not** true.

A. Resonating structure with more number of covalent bonds and lesser charge separation are more stable.

B. In electromeric effect, an unsaturated system shows + E effect with nucleophile and –E effect with electrophile.

C. Inductive effect is responsible for high melting point, boiling point and dipole moment of polar compounds.

D. The greater the number of alkyl groups attached to the doubly bonded carbon atoms, higher is the heat of hydrogenation.

E. Stability of carbanion increases with the increase in s-character of the carbon carrying the negative charge.

Choose the ***correct*** answer from the options given below.

(1) A, D & E only (2) B, D & E only

(3) A, C & D only (4) B & D only

Ans. (4)

Sol. Statement B & D are not true

61. The correct order of C, N, O and F in terms of second ionisation potential is

(1) F < N < C < O (2) C < O < N < F

(3) C < N < F < O (4) C < F < N < O

Ans. (2)

Sol. To compare second ionization potential configuration of mono-cation is observed

C^+	N^+	O^+	F^+
[He] $2s^2sp^1$	[He] $2s^22p^2$	[He] $2s^22p^3$ Half-filled stable.	[He] $2s^22p^4$

2^{nd} IE order

O > F > N > C

62. In the Group analysis of cations , Ba^{2+} & Ca^{2+} are precipitated respectively as

(1) sulphide & sulphide

(2) hydroxide & carbonate

(3) carbonate & carbonate

(4) chromate & sulphide

Ans. (3)

Sol. To identify Ba^{2+} & Ca^{2+}

Reagent $(NH_4)_2CO_3 + NH_4Cl$ is used $BaCO_3$ & $CaCO_3$ are obtained as precipitates

63. The wavelength of spectral line obtained in the spectrum of LI^{2+} ion, when the transition takes place between two levels whose sum is 4 and difference is 2, is

(1) 2.28×10^{-7} cm

(2) 2.28×10^{-6} cm

(3) 1.14×10^{-7} cm

(4) 1.14×10^{-6} cm

Ans. (4)

Sol. $n_1 \rightarrow$ lower energy level

$n_2 \rightarrow$ higher energy level

$n_1 + n_2 = 4, \quad n_2 = 3$

$n_2 - n_1 = 2, \quad n_1 = 1$

Rydberg's formula :

$$\frac{1}{\lambda} = R_H Z^2 \left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$$

$$\frac{1}{\lambda} = R_H (3)^2 \left[\frac{1}{1^2} - \frac{1}{3^2}\right]$$

$$\frac{1}{\lambda} = 8R_H$$

$$\lambda = \frac{1}{8R_H}$$

$$\lambda = \frac{1}{8 \times 1.1 \times 10^5}$$

$$\lambda = \frac{1000}{8.8} \times 10^{-8} \text{ cm}$$

$\lambda = 113.63 \times 10^{-8}$ cm

$\lambda \simeq 1.14 \times 10^{-6}$ cm

64. Given below are two statements :

Statement I : Cross aldol condensation between two different aldehydes will always produce four different products.

Statement II : When semicarbazide reacts with a mixture of benzaldehyde and acetophenone under optimum pH, it forms a condensation product with acetophenone only.

In the light of the above statements, choose the ***correct*** answer from the options given below :

(1) Both Statement I and Statement II are false

(2) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are true

(4) Statement I is true but Statement II is false

Ans. (1)

Sol. **Statement I :** False

Cross aldol can give 2 or 4 products

Statement II : False

Benzaldehyde & Acetone both react with semi carbazide.

65. Given below are two statements :

Statement I : The dipole moment of R-CN is greater than R-NC and R-NC can undergo hydrolysis under acidic medium to produce $R-\overset{\overset{O}{\|}}{C}-OH$.

Statement II : R-CN hydrolyses under acidic medium to produce a compound which on treatment with $SOCl_2$, followed by the addition of NH_3 gives another compound(x). This compound (x) on treatment with NaOCl/NaOH gives a product, that on treatment with $CHCl_3$/KOH/Δ produces R-NC

In the light of the above statements, choose the ***correct*** answer from the options given below :

(1) Both Statement I and Statement II are false

(2) Both Statement I and Statement II are true

(3) Statement I is true but Statement II is false

(4) Statement I is false but Statement II is true

Ans. (4)

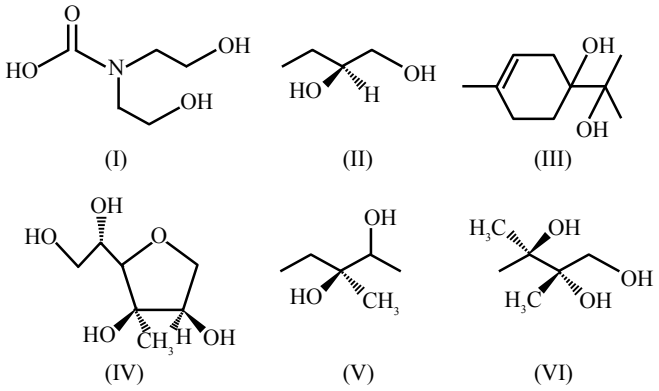
Sol. **Statement I :** False

$$R-NC \xrightarrow{H_3O^+} R-NH_2 + HCOOH$$

Statement II : True

$$R-CN \xrightarrow{H_3O^+} RCOOH \xrightarrow{SOCl_2} RCOCl \xrightarrow{NH_3} RCONH_2 \xrightarrow{NaOCl/OH^-} RNH_2 \xrightarrow{CHCl_3+KOH} R-NC$$

66. From the following, how many compounds contain at least one secondary alcohol ?



Choose the ***correct*** answer from the options given below :

(1) Five (2) Three

(3) Four (4) two

Ans. **(2)**

Sol. II, IV & V are secondary alcohol.

67. The heat of atomisation of methane and ethane are 'x' kJ mol^{-1} and 'y' kJ mol^{-1} respectively. The longest wavelength (λ) of light capable of breaking the C-C bond can be expressed in SI unit as :

(1) $\frac{hc}{1000}\left(\frac{y-6x}{4}\right)^{-1}$ (2) $\frac{N_A hc}{250(4y-6x)}$

(3) $\frac{N_A hc}{250(y-6x)}$ (4) $N_A hc\left(y-\frac{6x}{4}\right)^{-1}$

Ans. **(2)**

Sol. $CH_4(g) \rightarrow C(g) + 4H(g)$; $\Delta_r H = x$ kJ/mole

$C_2H_6(g) \rightarrow 2C(g) + 6H(g)$; $\Delta_r H = y$ kJ/mole

$1000x = 4 \times \varepsilon_{C-H}$

$1000y = 1 \times \varepsilon_{C-C} + 6 \times \varepsilon_{C-H}$

$\varepsilon_{C-C} = \left[y - \frac{3x}{2}\right] \times 1000 = \frac{hc}{\lambda}.N_A$

$('\lambda')$ wavelength of photon $= \frac{hc\ N_A}{[4y-6x]\times 250}$

68. At 298 K, the mole percentage of $N_2(g)$ in air is 80%. Water is in equilibrium with air at a pressure of 10 atm. What is the mole fraction of $N_2(g)$ in water at 298 K ? (K_H for N_2 is 6.5×10^7 mm Hg)

(1) 1.23×10^{-7} (2) 1.17×10^{-4}

(3) 9.35×10^{5} (4) 9.35×10^{-5}

Ans. **(4)**

Sol. $P_{N_2} = K_H.X_{N_2}$

$P_{N_2} = 0.8 \times 10 = 8$ atm

$8 \times 760 = 6.5 \times 10^7 \times X_{N_2}$

$X_{N_2} = \frac{8\times 760}{6.5\times 10^7}$

$X_{N_2} = 9.35 \times 10^{-5}$.

69. "X" is an oxoanion of the lightest element of group 7 (in the periodic table). The metal is in +6 oxidation state in "X". The color of the potassium salt of X is

(1) green (2) purple (3) yellow (4) orange

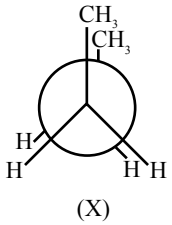
Ans. **(1)**

Sol. Lightest element of Group 7 $\Rightarrow$ Mn

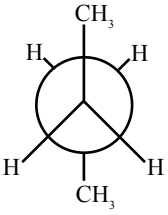
$K_2MnO_4 \Rightarrow$ Green

70. Given below are two statements :

Statement I : There are several conformers for n-butane. Out of those conformers,



is the least stable and most stable conformer is



Statement II : As the dihedral angle increases, torsional strain decreases from (X) to (Y).

In the light of the above statements, choose the ***correct*** answer from the options given below :

(1) Both Statement I and Statement II are false

(2) Statement I is false but Statement II is true

(3) Statement I is true but Statement II is false

(4) Both Statement I and Statement II are true

Ans. **(4)**

Sol. Both Statements are correct.

SECTION-B

71. 0.25 g of an organic compound "A" containing carbon, hydrogen and oxygen was analysed using the combustion method. There was an increase in mass of $CaCl_2$ tube and potash tube at the end of the experiment. The amount was found to be 0.15 g and 0.1837 g, respectively. The percentage of oxygen in compound A is _____%. (Nearest integer)
(Given : molar mass in g mol^{-1} H : 1, C : 12, O : 16)

Ans. **(73)**

Sol. $C_xH_yO_z + O_2 \rightarrow CO_2 + H_2O$

$t = 0 \quad 0.25$ gm

$t_{eq} \quad - \quad 0.18$ gm $\quad 0.15$ gm

Mass of 'C' $= \frac{0.18}{44} \times 12 = 0.049 \simeq 0.05$ gm

Mass of 'H' $= \frac{0.15}{18} \times 2 = 0.016 \simeq 0.017$ gm.

Mass of 'O' $= 0.25 - 0.05 - 0.017 = 0.1833$ gm

Mass % of 'O' $= \frac{0.1833}{0.25} \times 100 = 73.32\%$.

72. The half-life of ^{65}Zn is 245 days. After x days, 75% of original activity remained. The value of x in days is _____. (Nearest integer)
(Given : log 3 = 0.4771 and log 2 = 0.3010)

Ans. **(102)**

Sol. $t_{1/2} = \frac{\ell n 2}{K}$

$K = \frac{\ell n 2}{245}$

$t = \frac{1}{K} \ell n \frac{a_0}{a_t}$

$t_{25\%} = \frac{1}{K} \ell n \frac{4}{3}$

$t_{25\%} = \frac{1}{\frac{\ell n 2}{245}} \ell n \frac{4}{3}$

$t_{25\%} = 245 \frac{\ell n \frac{4}{3}}{\ell n 2} = 245 \left[\frac{2\log 2 - \log 3}{\log 2}\right]$

$= 245 \left[\frac{2 \times 0.3010 - 0.4771}{0.3010}\right] = 101.66$ day.

73. A chromium complex with a formula $CrCl_3.6H_2O$ has a spin only magnetic moment value of 3.87 BM and its solution conductivity corresponds to 1 : 2 electrolyte. 2.75 g of the complex solution was initially passed through a cation exchanger. The solution obtained after the process was reacted with excess of $AgNO_3$. The amount of AgCl formed in the above process is _____ g. (Nearest integer)
[Given : Molar mass in g mol^{-1} Cr : 52; Cl : 35.5, Ag : 108, O : 16, H : 1]

Ans. **(3)**

Sol. $[Cr(H_2O)_5Cl]Cl_2.H_2O + AgNO_3 \rightarrow 2AgCl$

$2.75/266.5 \quad -$

$= 0.0103$ moles $\quad 0.02063$ mole

Mass of AgCl $= 0.02063 \times 143.5 = 2.96$ gm

74. Molar conductivity of a weak acid HQ of concentration 0.18 M was found to be 1/30 of the molar conductivity of another weak acid HZ with concentration of 0.02 of M. If $\lambda^0_{Q^-}$ happened to be equal with $\lambda^0_{Z^-}$, then the difference of the pK_a values of the two weak acids (pK_a(HQ)–pK_a(HZ)) is _____ (Nearest integer).
[Given : degree of dissociation (α) << 1 for both weak acids, λ° : limiting molar conductivity of ions]

Ans. **(2)**

Sol. $K_a(HQ) = C_1\alpha_1^2 \qquad \alpha_1 = \frac{\lambda_m(HQ)}{\lambda_m^\infty(HQ)}$

$K_a(HZ) = C_2\alpha_2^2 \qquad \alpha_2 = \frac{\lambda_m(HZ)}{\lambda_m^\infty(HZ)}$

$\frac{K_a(HQ)}{K_a(HZ)} = \frac{C_1}{C_2}.\left(\frac{\alpha_1}{\alpha_2}\right)^2 = \frac{0.18}{0.02}.\left[\frac{\lambda_m(HQ)}{\lambda_m(HZ)}\right]^2$

$\frac{K_a(HQ)}{K_a(HQ)} = 9 \times \left(\frac{1}{30}\right)^2 = \frac{1}{100}$

$pK_a(HQ) - pK_a(HZ) = 2$

75. Grignard reagent RMgBr(P) reacts with water and forms a gas (Q). One gram of Q occupies 1.4 dm^3 at STP. (P) on reaction with dry ice in dry ether followed by H_3O^+ forms a compound (Z). 0.1 mole of (Z) will weigh _____ g. (Nearest integer)

Ans. **(6)**

Sol. 1.4 dm^3 (or 1.4 mL) occupied by 1 gm

$\therefore$ Molecular weight of Q $= \frac{22.4}{1.4} = 16$

$\therefore$ Q is CH_4 gas and Grignard reagent is CH_3MgBr

$CH_3MgBr \xrightarrow[(ii)\,H_3O^+]{(i)\,CO_2\,(dry\,ice)} CH_3COOH$

(Molecular weight 60)

$\therefore$ Weight of 0.1 mole of $CH_3COOH = 6$